

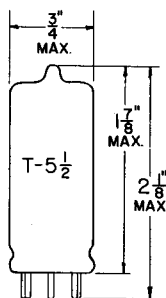
## TUNG-SOL

## PENTODE

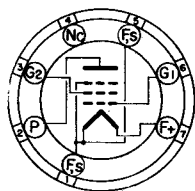
MINIATURE TYPE

HEATER

ANY MOUNTING POSITION



GLASS BULB



**BOTTOM VIEW**  
MINIATURE BUTTON  
7 PIN BASE

6AR

THE 1U4WA IS A FILAMENT TYPE SHARP CUT-OFF PENTODE IN THE 7 PIN MINIATURE CONSTRUCTION. IT IS DESIGNED FOR RF AND AF APPLICATIONS IN PORTABLE EQUIPMENT WHERE EXTREME CONDITIONS OF MECHANICAL SHOCK OR VIBRATION ARE ENCOUNTERED. THE TUBE IS PARTICULARLY USEFUL IN VOLTAGE AMPLIFIER CIRCUITS WHERE ITS LOW MICROPHONIC NOISE AND VIBRATION OUTPUT ARE ESSENTIAL FOR SPECIALIZED MILITARY ELECTRONIC EQUIPMENT.

## RATINGS

MECHANICAL

|                                                                 |     |   |
|-----------------------------------------------------------------|-----|---|
| MAXIMUM IMPACT ACCELERATION (SHOCK TEST - NOTE 2)               | 450 | G |
| MAXIMUM VIBRATIONAL ACCELERATION (96 HR. FATIGUE TEST (NOTE 3)) | 2.5 | G |

## RATINGS

AND NORMAL OPERATION

| MIL-E-1<br>SYMBOL        | DES.<br>MIN. | NORM.<br>TEST<br>CONDI-<br>TIONS<br>NOTE 5 | NORM.<br>OPER-<br>ATION<br>NOTE 4 | DES.<br>MAX. | MIL-E-1<br>UNITS |
|--------------------------|--------------|--------------------------------------------|-----------------------------------|--------------|------------------|
| HEATER VOLTAGE (NOTE 6)  | Ef: 1.00     | 1.25                                       | 1.25                              | 1.50         | Vdc              |
| PLATE VOLTAGE (NOTE 7)   | Eb: ---      | 90                                         | 90                                | 135          | Vdc              |
| GRID VOLTAGE             | Ec1: ---     | 0                                          | 0                                 | ---          | Vdc              |
| GRID VOLTAGE #2 (NOTE 7) | Ec2: ---     | 90                                         | 90                                | 135          | Vdc              |
| PLATE DISSIPATION        | Pp: ---      | ---                                        | ---                               | 0.17         | WATTS            |
| GRID #2 DISSIPATION      | Pg2: ---     | ---                                        | ---                               | 0.05         | WATTS            |
| GRID RESISTANCE          | Rg(1): ---   | ---                                        | ---                               | 2.0          | MEG.             |
| TRANSCONDUCTANCE         | Sm: ---      | ---                                        | 900                               | ---          | μMHOS            |
| PLATE CURRENT            | Ib1: ---     | ---                                        | 1.6                               | ---          | mAcd             |
| CATHODE CURRENT          | Ik: ---      | ---                                        | ---                               | 3.0          | mAcd             |

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## TUNG-SOL

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CHARACTERISTICS AND QUALITY CONTROL<sup>1</sup>

| TEST                                                | AQL<br>% | MIL E-1<br>SYMBOL | MIN. | LAL | BOG. | UAL | MAX. | ALD | MIL-E-1<br>UNITS |
|-----------------------------------------------------|----------|-------------------|------|-----|------|-----|------|-----|------------------|
| MEASUREMENTS ACCEPTANCE                             |          |                   |      |     |      |     |      |     |                  |
| TESTS PART 1                                        |          |                   |      |     |      |     |      |     |                  |
| COMBINED AQL=1.0 % EXCLUDING MECH. AND INOPERATIVES |          |                   |      |     |      |     |      |     |                  |
| GRID CURRENT (1):                                   |          |                   |      |     |      |     |      |     |                  |
| Eb=Ec2=135 Vdc;                                     |          |                   |      |     |      |     |      |     |                  |
| Ec1=2.0 Vdc                                         | 0.65     | Ic1:              | 0    | --- | ---  | --- | -1.0 | --- | $\mu$ Adc        |
| PLATE CURRENT (1):                                  | 0.65     | Ib1:              | 1.0  | --- | ---  | --- | 2.1  | --- | mAdc             |
| SCREEN GRID CURRENT:                                | 0.65     | Ic2:              | 0.28 | --- | ---  | --- | 0.62 | --- | mAdc             |
| TRANSCONDUCTANCE (1):                               | 0.65     | Sm(1):            | 720  | --- | ---  | --- | 1080 | --- | $\mu$ MHOS       |
| NOISE AND MICROPHONICS:                             |          |                   |      |     |      |     |      |     |                  |
| Ebb=Ecc2=90 Vdc;                                    |          |                   |      |     |      |     |      |     |                  |
| Ecal=10.0mVac;Rp=                                   |          |                   |      |     |      |     |      |     |                  |
| 1.0 MEG.; Rg2=4.7 MEG.;                             |          |                   |      |     |      |     |      |     |                  |
| Cg2=0.1 $\mu$ f                                     | 0.65     | EB:               | ---  | --- | ---  | --- | 17   | --- | VU               |
| CONTINUITY AND SHORTS:                              |          |                   |      |     |      |     |      |     |                  |
| (INOPERATIVES)                                      | 0.4      | ---               | ---  | --- | ---  | --- | ---  | --- | ---              |
| MECHANICAL:                                         |          |                   |      |     |      |     |      |     |                  |
| (ENVELOPE OUTLINE                                   |          |                   |      |     |      |     |      |     |                  |
| 6-2)                                                | ---      | ---               | ---  | --- | ---  | --- | ---  | --- | ---              |
| MEASUREMENTS ACCEPTANCE                             |          |                   |      |     |      |     |      |     |                  |
| TESTS- PART 2                                       |          |                   |      |     |      |     |      |     |                  |
| INSULATION OF ELECTRODES:                           |          |                   |      |     |      |     |      |     |                  |
| g-all=100 Vdc                                       |          | Rg-all:           | 100  | --- | ---  | --- | ---  | --- | MEG.             |
| p-all=100Vdc                                        | 4.0      | Rp-all:           | 100  | --- | ---  | --- | ---  | --- | MEG.             |
| PLATE CURRENT(2):                                   |          |                   |      |     |      |     |      |     |                  |
| Ec1=4.5 Vdc                                         | 6.5      | Ib:               | 0    | --- | ---  | --- | 30   | --- | $\mu$ Adc        |
| TRANSCONDUCTANCE (2):                               |          |                   |      |     |      |     |      |     |                  |
| Ef= 1.0 Vdc                                         | 6.5      | Sm(2):            | 610  | --- | ---  | --- | 1080 | --- | $\mu$ MHOS       |
| FILAMENT CURRENT:                                   |          |                   |      |     |      |     |      |     |                  |
|                                                     | 6.5      | If:               | 44   | --- | ---  | --- | 56   | --- | mA               |
| CAPACITANCE: } SHIELD                               |          |                   |      |     |      |     |      |     |                  |
| Cg1p:                                               |          |                   | ---  | --- | ---  | --- | 0.02 | --- | $\mu$ f          |
| CAPACITANCE                                         | 6.5      | Cin:              | 3.0  | --- | ---  | --- | 4.2  | --- | $\mu$ f          |
| CAPACITANCE                                         |          | Cout:             | 5.6  | --- | ---  | --- | 7.6  | --- | $\mu$ f          |
| VIBRATION (1):                                      |          |                   |      |     |      |     |      |     |                  |
| Rp=10,000 OHMS;                                     |          |                   |      |     |      |     |      |     |                  |
| 40 cps;15 g                                         | 6.5      | Ep:               | ---  | --- | ---  | --- | 10   | --- | mVac             |
| VIBRATION (2):                                      |          |                   |      |     |      |     |      |     |                  |
| f=50 cps-3500 cps;                                  |          |                   |      |     |      |     |      |     |                  |
| Rp=10,000 OHMS                                      |          |                   |      |     |      |     |      |     |                  |
| (NOTE 8)                                            | 6.5      | Ep(2):            | ---  | --- | ---  | --- | 15   | --- | mVac             |
| DEGRADATION RATE                                    |          |                   |      |     |      |     |      |     |                  |
| ACCEPTANCE TESTS                                    |          |                   |      |     |      |     |      |     |                  |
| SHOCK::                                             |          |                   |      |     |      |     |      |     |                  |
| HAMMER ANGLE=30°                                    |          |                   |      |     |      |     |      |     |                  |
| (NOTE 2)                                            | ---      | ---               | ---  | --- | ---  | --- | ---  | --- | ---              |
| FATIGUE:                                            |          |                   |      |     |      |     |      |     |                  |
| G=2.5; F=25cps MIN;                                 |          |                   |      |     |      |     |      |     |                  |
| 60 cps MAX; FIXED                                   |          |                   |      |     |      |     |      |     |                  |
| FREQUENCY                                           |          |                   |      |     |      |     |      |     |                  |
| (NOTE 3)                                            | 6.5      | ---               | ---  | --- | ---  | --- | ---  | --- | ---              |

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**TUNG-SOL**

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### CHARACTERISTICS AND QUALITY CONTROL<sup>1</sup>; cont'd.

| TEST                                                                               | AQL<br>%                                           | MIL-E-1<br>SYMBOL                             | MIN            | LAL      | BOG.            | UAL  | MAX. | ALD              | MIL-E-1<br>UNITS |
|------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------|----------------|----------|-----------------|------|------|------------------|------------------|
| DEGRADATION RATE                                                                   |                                                    |                                               |                |          |                 |      |      |                  |                  |
| ACCEPTANCE TESTS (CONT'D.)                                                         | COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES |                                               |                |          |                 |      |      |                  |                  |
| POST SHOCK AND FATIGUE                                                             |                                                    |                                               |                |          |                 |      |      |                  |                  |
| TEST END POINTS:                                                                   |                                                    |                                               |                |          |                 |      |      |                  |                  |
| TRANSDUCANCE (1)                                                                   | ---                                                | Sm:                                           | 540            | ---      | ---             | ---  | ---  | ---              | $\mu$ MHOS       |
| VIBRATION                                                                          | ---                                                | Ep:                                           | ---            | ---      | ---             | ---  | 15   | ---              | mVac             |
| MINIATURE TUBE BASE STRAIN:                                                        | ---                                                | ---                                           | ---            | ---      | ---             | ---  | ---  | ---              | ---              |
| GLASS STRAIN                                                                       |                                                    |                                               |                |          |                 |      |      |                  |                  |
| (THERMAL SHOCK):                                                                   | 2.5                                                | ---                                           | ---            | ---      | ---             | ---  | ---  | ---              | ---              |
|                                                                                    |                                                    | ALLOWABLE DEF.<br>PER CHARACTER.<br>1st SAMP. | COMB.<br>SAMP. | AQL<br>% | MIL-E-1<br>SYM. | MIN. | MAX. | MIL-E-1<br>UNITS |                  |
| ACCEPTANCE LIFE TESTS                                                              |                                                    |                                               |                |          |                 |      |      |                  |                  |
| INTERMITTENT LIFE TEST:<br>Ef=1.25 Vdc; OR Vac WITH<br>EQUIVALENT BIAS;<br>GROUP A | ---                                                | ---                                           | ---            | t:       | 500             | ---  | ---  | HOURS            |                  |
| INTERMITTENT LIFE TEST<br>END POINTS:                                              |                                                    |                                               |                |          |                 |      |      |                  |                  |
| TRANSDUCANCE (1)                                                                   | ---                                                | ---                                           | ---            | Sm(1):   | 540             | ---  | ---  | $\mu$ MHOS       |                  |
| GRID CURRENT                                                                       | ---                                                | ---                                           | ---            | Ic(1):   | ---             | -1.0 | ---  | $\mu$ Adc        |                  |

## NOTES

1. CHARACTERISTICS, QUALITY CONTROL PROCEDURES, AND INSPECTION LEVELS ARE MADE ACCORDING TO THE APPROPRIATE PARAGRAPHS OF MIL-E-1, AND MIL-STD-105A.
2. TEST CONDITIONS AND ACCEPTANCE CRITERIA PER SHOCK TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.
3. TEST CONDITIONS AND ACCEPTANCE CRITERIA PER FATIGUE TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.
4. THESE NORMAL VALUES REPRESENT CONDITIONS AT WHICH CONTROL OF RELIABILITY MAY BE EXPECTED.
5. THESE NORMAL TEST CONDITIONS ARE USED FOR ALL CHARACTERISTICS UNLESS OTHERWISE STATED UNDER THE INDIVIDUAL TEST ITEM.
6. FOR MOST APPLICATIONS THE PERFORMANCE WILL NOT BE ADVERSELY AFFECTED BY  $\pm 10\%$  HEATER VOLTAGE VARIATION, BUT WHEN THE APPLICATION CAN PROVIDE A CLOSER CONTROL OF HEATER VOLTAGE, AND IMPROVEMENT IN RELIABILITY WILL BE REALIZED.
7. PLATE AND SCREEN VOLTAGES SHOULD NOT EXCEED THESE VALUES UNDER ANY CIRCUMSTANCES.
8. THE TUBE UNDER TEST SHALL BE RIGIDLY MOUNTED ON A VIBRATION TABLE VIBRATING WITH SIMPLE HARMONIC MOTION. THE TEST CONDITIONS OF PARAGRAPH 4.9.19.1 OF MIL-E-1 SHALL BE APPLIED AND  $E_p$  MONITORED WHILE THE FREQUENCY OF VIBRATION IS CONTINUOUSLY SWEEPED FROM 50-3500 CPS AND THE PEAK ACCELERATION CONTROLLED CONSTANT AT 2G. A LOW PASS FILTER WHICH FOLLOWS THE LOAD RESISTOR OF THE TUBE UNDER TEST SHALL HAVE A CUT-OFF FREQUENCY OF 3500 CPS. THE TOTAL TIME OF SWEEP SHALL NOT BE LESS THAN ONE (1) MINUTE.

